

REMARKS

This application has been carefully reviewed in light of the Final Office Action dated May 13, 2008. Claims 1, 5-10, 16 and 20 remain in this application. Claim 1 is the independent Claim. Claims 1, 7 and 20 have been amended. Claims 2-4, 11-15 and 17-19 have been canceled, without prejudice. It is believed that no new matter is involved in the amendments or arguments presented herein.

Reconsideration and entrance of the amendment in the application are respectfully requested.

Telephone Interview Summary

Applicant thanks the Examiner for the courtesies extended in the Telephone Interview of November 10, 2008.

Applicant summarizes the points made during the interview below.

Art-Based Rejections

Claims 1-19 and new Claim 20 were rejected under 35 U.S.C. § 103(a) over European Patent Publication No. EP 1 014 766 A2 (Takahashi) in view of European Patent Publication No. EP 0 335 337 A2 (Watanabe).

Applicant respectfully traverses the rejections and submits that the claims herein are patentable in light of the clarifying amendments above and the arguments below.

The Takahashi Reference

Takahashi is directed to a flexible board including a metal foil provided with a laminated three layer polyimide resin structure (*See Takahashi; Paragraph [0009]*).

The Watanabe Reference

Watanabe is directed to resin layers of low and high thermal expansion coefficients (*See Watanabe; Page 3, lines 5-15, Page 4, lines 24-34 and Page 6, lines 26-47*).

The Claims are Patentable Over the Cited References

The present application is generally directed to a bonding sheet that can be bonded with a metal foil.

As defined by amended independent Claim 1, a bonding sheet includes a first layer containing a thermoplastic resin disposed on one side of a heat resistant film and a second layer different from the first layer containing a non-thermoplastic resin and a thermoplastic resin disposed on the other side of the heat resistant film. The second layer exhibits no adhesiveness during thermal lamination. The heat resistant film is a polyimide film. The thermoplastic resin in the first layer and the non-thermoplastic resin in the second layer are polyimides. The ratio of the non-thermoplastic resin to the thermoplastic resin in the second layer is 82/18 to 97/3 on a weight basis.

The applied references fail to disclose or suggest the above features of the claims of the present invention. In particular, the applied references fails to disclose or suggest, "the second layer exhibits no adhesiveness during thermal lamination, wherein the heat resistant film is a polyimide film, wherein the thermoplastic resin in the first layer and the non-thermoplastic resin and the thermoplastic resin in the second layer are polyimides, wherein the ratio of the non-thermoplastic resin to the thermoplastic resin in the second layer is 82/18 to 97/3 on a weight basis," as required by amended independent Claim 1 of the present invention.

The bonding sheet produced in Examples 1-3 were produced using the claimed mixing ratios of the present invention (*See Specification; Page 20, line 18 to Page 35*). As shown in Table 1, Examples 1-5 show good lamination without sticking, separation

or the like. Also, Examples 1-5 show little warpage and good peeling strength. However, in Examples, 6 and 7, the mixing ratio of non-thermoplastic resin to thermoplastic resin is outside the claimed range, and exhibited a moderate degree of sticking and separation. Furthermore, Comparative Examples 1-4 display poor properties when compared to Examples 1-3. Comparative Examples 1 and 2 show that the thermoplastic polyimide disposed on both sides could not be laminated due to sticking. Comparative Example 3 discloses a bonding sheet that suffers from a large amount of warpage in comparison to Examples 1-3. The non-adhesive layer of Comparative Example 4 did not adequately adhere to a core film and is thus, unacceptable. Thus, Applicant submits that the claimed features recited in independent Claim 1 provide unexpected results and superior properties neither envisioned nor shown in the prior art, as disclosed in Table 1.

Takahashi does not disclose or suggest the specific ratio of non-thermoplastic resin to thermoplastic resin as provided by Applicant, and therefore does not disclose or suggest the superior and unexpected properties provided by the present invention. Moreover, Watanabe discloses arrangement of polyimide resins of different thermal expansion values with a conductor. The layers of Watanabe are distinct and do not constitute Applicant's non-adhesive layer.

In contrast, the present invention requires the ratio of non-thermoplastic resin to the thermoplastic resin in the non-adhesive second layer to be between 82/18 to 97/3 on a weight basis. In this manner, the laminate of the present invention provides lamination without sticking or separation and displays vastly lower values of warping in the bonding sheet and metal-clad laminate than in the prior art. Therefore, the bonding sheet does not stick to a metal roll or the like, and allows a metal-clad laminate formed from the bonding sheet to exhibit high adhesive strength and a reduction in warpage. Thus, the bonding sheet and the metal-clad laminate can be used in electronic devices (*See Specification; Page 35, lines 1-16*).

Moreover, the Action concedes that Takahashi lacks teaching of the combination of thermoplastic and non-thermoplastic resins in an outer layer 2c. At best, Takahashi teaches a non-thermoplastic layer 2c. Paragraph [0031] is cited for teaching a "heat-resistant" resin, but doesn't teach the addition of polyimide resins or whether the resins are thermoplastic or non-thermoplastic. Thus, Takahashi fails to anticipate Claim 1. Furthermore, Applicant believes that within the context of Takahashi, the materials that can be added to a resin merely refer to known additives such as a coupling agent, filler, etc.

Importantly, Applicant respectfully submits that one of skill would not look to combine the thermoplastic and non-thermoplastic polyimides in a single layer because of the complicated process involved in combining these different types of polyimides that is very different from the conventional process of adding additives to a resin. For example, Applicant's specification at page 13, lines 15 to page 14, line 2 teaches that for a thermoplastic polyimide and non-thermoplastic polyimide layer, two different varnishes (polyamic acid solution) must be prepared and blended in a varnish, which is a complicated process. Therefore, those in the art would look to modify the properties of a polyimide resin by copolymerization of different monomers, as disclosed in the examples of Takahashi.

Even if one in the art were to mix another polyimide resin to layers 2a and 2c of Takahashi, that person would mix thermoplastic resin to thermoplastic layer and non-thermoplastic resin to the non-thermoplastic layer. In other words, one of ordinary skill would mix like with like because of the difficulties in mixing thermoplastic with non-thermoplastic. Mixing thermoplastic and non-thermoplastic is not a trivial process.

Furthermore, Applicant notes that thermoplastics are generally used for adhesiveness, such that the addition of a thermoplastic in a layer exhibiting no adhesiveness during thermal lamination such as Takahashi's layer 2c goes against convention and demonstrates non-obviousness.

Watanabe discloses a high thermal expansion layer of thermoplastics and a low thermal expansion layer. However, the layers are distinct and not mixed. Similar to Takahashi, Watanabe discloses that resins may be blended with other resins, but fails to teach or suggest blending of the thermoplastic layer and non-thermoplastic layer to form a second layer having non adhesiveness during thermal lamination.

Moreover, in none of the examples of Takahashi and Watanabe is there the combination of thermoplastic resin with non-thermoplastic resin to form an outer layer. Thus, the examples clarify the context of the disclosure of "blending" and "mixing" to clarify that like resins are mixed with other like resins and further demonstrate that Applicant's claimed non-adhesive layer is inventive.

For these reasons, the mixing of a thermoplastic resin to a non-thermoplastic resin to achieve a desired coefficient of linear expansion is clearly not desirable when a simpler process is readily available.

In sum, Watanabe and Takahashi focus on layers having specific linear expansion coefficients and not the composition of those layers. Although examples of resins are provided, one of ordinary skill would not look to combine thermoplastic polyimide resins with non-thermoplastic polyimide resins because of the added difficulty in forming such layers when the expansion coefficient adjustment is more easily provided by conventional techniques. Thus, the cited references neither disclose Applicant's combination nor appreciate the benefits from such combination. As disclosed in Paragraph [0028] of the published application, adding thermoplastic polyimide resin to a non-adhesive layer provides the dual function of preventing adhesion during lamination (provided by the non-thermoplastic polyimide) along with secure adhesiveness to the heat resistant film (provided by the thermoplastic polyimide). As another benefit, the combination of thermoplastic and non-thermoplastic more consistently aligns the expansion coefficient of the non-adhesive layer to that of

the adhesive layer over a non-adhesive layer of only non-thermoplastic resin which suffers from a wide variation in linear expansion coefficient.

Thus, Takahasi and Watanabe do not disclose or suggest this feature of the present invention as required by independent Claim 1.

Since the applied references fail to disclose, teach or suggest the above features recited in amended independent Claim 1, those references cannot be said to anticipate nor render obvious the invention which is the subject matter of that claim.

Accordingly, amended independent Claim 1 is believed to be in condition for allowance and such allowance is respectfully requested.

The remaining claims depend either directly or indirectly from amended independent Claim 1 and recite additional features of the invention which are neither disclosed nor fairly suggested by the applied references and are therefore also believed to be in condition for allowance.

For example, dependent Claims 8 and 19 recite "a thermal roll laminator including at least one pair of metal rolls bonds the metal foil onto the bonding sheet." Furthermore, dependent Claim 20 recites applying a mixture of non-thermoplastic polyimide and thermoplastic polyimide, followed by imidization. Page 3 and 5 of the Office Action asserts that these features are directed to product by process claims. However, M.P.E.P. § 2113 states "the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of

construction as structural limitation)." Thus, bonding by a thermal roll laminator provides a thermally bonded and imidized structure that is clearly structurally different from Takahashi's mere "attachment to a metal foil 1". Moreover, Watanabe merely teaches blending but does not teach Applicant's imidization which provides a structural difference between the claimed invention and the applied references.

Conclusion

Applicant believes the foregoing amendments comply with requirements of form and thus may be admitted under 37 C.F.R. § 1.116(b). Alternatively, if these amendments are deemed to touch the merits, admission is requested under 37 C.F.R. § 1.116(c). In this connection, these amendments were not earlier presented because they are in response to the matters pointed out for the first time in the Final Office Action.

Lastly, admission is requested under 37 C.F.R. § 1.116(b) as presenting rejected claims in better form for consideration on appeal.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (310) 785-4721 to discuss the steps necessary for placing the application in condition for allowance.

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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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